

Section IV. REMARKS

Rejection of Claims on Reference Grounds, and Traversal Thereof

In the February 6, 2003 Office Action, claims 1-39 were rejected on reference grounds, including:

a rejection of claims 1-10 and 18 under 35 U.S.C. §102(e) as anticipated by Lu et al. USP 6,365,517 (hereafter "Lu"); and

a rejection of claims 11-17 and 19-39 under 35 U.S.C. §103(a) as unpatentable over Lu in view of Tsu et al. USP 6,294,420 (hereafter "Tsu") and Tang et al. USP 6,462,931 (hereafter "Tang").

Such rejections of claims are traversed in respect of claims 1-39 as amended herein, and consideration of the patentable distinction of such amended claims is requested in light of the following remarks.

§102 Rejection of Claims 1-10 and 18 as anticipated by Lu

Claim 1 has been amended herein to recite a microelectronic structure comprising, *inter alia*,

"at least one conductive barrier layer in contact with the layer of high dielectric constant material, wherein such conductive barrier layer comprises at least one material selected from the group consisting of Pt, Ir, IrO₂, Ir₂O₃, Ru, RuO₂, TaN, NbN, HfN, ZrN, WN, W₂N, TiAlN, TaSiN, NbAlN, and compatible combinations, mixtures and alloys thereof"

argue | By contrast, Lu describes thin film structures including a diffusion barrier that is either TiN, TiSi_xN_y or TiN_xB_y (column 4, lines 32-36).

Accordingly, the microelectronic structure of claim 1 as amended, and dependent claims 2-10 and 18 thereunder, is patentably distinguishable from Lu's thin film structure.

§103 Rejection of Claims 11-17 and 19-39 Over Lu in View of Tsu and Tang

The deficiency of Lu in relation to applicants' amended claim 1 has been set out above. The teachings of Tsu and Tang do not overcome such deficiency.

argue Tsu describes IC capacitor structure in which an Al or Cu metalization layer directly contacts the dielectric layer (FIG. 3g) without intermediate barrier layer material, which is inconsistent with and teaches away from applicants' claimed invention.

Tsu's conductive nitride layer (22) referred to by the Examiner (column 4, lines 34-57) is intermediate the dielectric material (16) and silicide layer (20). The silicide layer (20) is adjacent an electrode layer (18). The metals taught by Tsu for the electrode layer (18) are tungsten, titanium, tantalum, molybdenum, cobalt, zirconium, and ruthenium.

Tsu fails to provide any structure suggestive of the instant invention. Further, the teachings of Lu are specific for TiN, TiSi_xN_y or TiN_xB_y (column 4, lines 32-36), as discussed above. There is therefore no basis in Lu or Tsu for changing Lu's thin film structure in the manner proposed by the Examiner, particularly in view of the advantages taught by Lu (column 2, lines 13-21) that are specific to the disclosed TiN, TiSi_xN_y or TiN_xB_y layers utilized in Lu's structure. Why would one arbitrarily change the specific material layers that are taught by Lu to be responsible for such multiple advantages, with the corresponding loss of such advantages?

Tang describes a high dielectric constant capacitor and memory in which Ir or IrO_2 is used as a barrier layer material. The Examiner has cited FIG. 9a of such reference disclosing a BST / Ir / IrO_2 / Ir / Al layered structure. The Examiner has proposed substituting Tang's diffusion barrier in the Lu thin film structure "because it would have provided a low leakage currents [sic] and limited dielectric degradation" (citing column 1, line 57, lines 57-58).

This, however, ignores Lu's teaching that the barrier layer in his disclosed thin film structure has "lower resistivity" (column 4, line 46) and "low contact/via resistance" (column 4, lines 48-49), as well as "higher purity, density, and stability of the films formed by the instant invention" (column 2, lines 17-18) - all suggestive of superior electrical performance. There is therefore no basis in Lu or Tang for changing Lu's thin film structure in the manner proposed by the Examiner.

Further, amended claim 1, from which all other claims 2-39 directly or indirectly depends, requires that "when said material of said at least one metal layer is Al, said at least one material of said conductive barrier layer is not Ir or IrO₂."

Claims 11-17 and 19-39 are therefore patentable over Lu in view of Tsu and Tang.

Conclusion

Claims 1-39 as amended herein and now pending in the application, are fully patentably distinguished over the cited references, and in form and condition for allowance. Issue of a Notice of Allowance for the application is therefore requested.

If any issues remain outstanding, incident to the formal allowance of the application, the Examiner is requested to contact the undersigned attorney at (919) 419-9350 to discuss same, in order that this application may be allowed and passed to issue at an early date.

Respectfully submitted,



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